Turning to FIG. 2, there is shown another embodiment of the invention in which the housing **50,50'** also encloses the refrigerant coils **52,52'** and the brine inlet means **54,54'**. The latter are located above the coils **52,52'**, so as to drip or spray brine on the coils.

The embodiments of FIGS. **1** and **2** can be furnished with an inlet port **56** for introducing water to the brine reservoirs **14,14'**. This will enable the dilution of the brine when operating the system in very dry and hot climate, to further increase the efficiency thereof.

A modification of the system is illustrated in FIG. **3**. Here, the system (of FIG. 1) is further provided with an external source of humidity in the form of plants **58**, in order to increase the efficiency of the heat pump during the summer time. During the winter time, however, in order to increase the efficiency, it is recommended to elevate the temperature of the brine. This can be achieved by condensing the humidity of the brine by means of hot air blown by the blower **20**. A source of such hot air can be provided in the form of a hot water to air heat exchanger **60**, having a hot water inlet **62** leading to a drip or spray head **64**, a heat exchange media **66** and a water outlet **68**. The cold ambient air otherwise directly blown into the space **16** will thus be heated first and only thereafter introduced into the space **16**.

As can now be readily understood, the outside or room air introduced by blowers **20,21'** into the housings **8,8'**, flows as counter current or cross current to the droplets of brine dripping in the space **16,16'**, so as to exchange heat and vapor with the brine. Since the brine maintains the unit acting as an condenser at a temperature which is lower than the normal temperature, e.g., at 37° C. instead of 47° C., and parallely, maintains the evaporator's temperature higher than the normal temperature, e.g., 4° C. instead of 0° C., it can be shown that the efficiency of the cycle will be superior at a ratio, of about, e.g.:

$$\frac{47-0}{37-4}=1.4.$$

Hence, the coefficient of performance of the brine heat pump, according to the present invention as compared with conventional heat pumps, is substantially higher. In other words, for the same input of energy, the brine heat pump will remove 40% more heat from an enclosure in which it is installed as compared with conventional heat pumps, provided that the mechanical efficiency of the two compressors is the same.

The average temperature head between the fluid inside and the brine in the above example is 6° C. and it is anticipated that for an area of **1** square meter of heat exchanger, the heat transfer rate will be about 6 Kw.

Therefore, the heat exchange area between the brine and the working fluid (in heat exchangers **24** and **24'**) will be small compared with the area required to transfer heat from the working fluid to the air in conventional heat pumps.

The small area of the heat exchanger is related to the large heat conductivity between the condenser and the evaporator's walls (h=1000 W/Square M.° C.) and the brine. The air conductivity is characterized by **70** watt units only (Watts/(square m C.).

The invention is also usable for refrigeration purposes.

It will be evident to those skilled in the art that the invention is not limited to the details of the foregoing illustrated embodiments and that the present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

I claim:

1. A heat pump system comprising:

two, substantially similar units in fluid communication with each other, each unit including

a housing, a forced-air counter-flow air/brine heat exchanger, a brine/refrigerant heat exchanger, brine inlet means for applying brine onto at least one of said heat exchangers, a brine reservoir and means for circulating said brine from the reservoir to said inlet means,

said brine/refrigerant heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction, and for reversing the sense of circulation of the refrigerant inside said closed loop.

2. A heat pump system, comprising:

two, substantially similar units in fluid communication with each other, each unit including

a housing, brine inlet means at the top portion thereof, a first air/brine heat exchanger located adjacent said brine inlet means, a brine reservoir at the lower part of said housing and means for introducing forced air into brine-dripping space delimited between said first heat exchanger and said reservoir to produce a counter-flow air/brine heat exchanger, and

a second heat exchanger in liquid communication with said brine inlet means and said reservoir;

the reservoir of each unit being in liquid communication with each other;

said second heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction, and for reversing the sense of circulation of the refrigerant inside said closed loop, and

means for circulating brine between said reservoir and said second heat exchanger of each unit.

3. The heat pump system as claimed in claim **1**, wherein said brine inlet means are drip or spray nozzles.

4. The heat pump system as claimed in claim **2**, wherein said means for introducing air is a blower.

5. The heat pump system as claimed in claim **1**, wherein said housing is common to said first and second heat exchangers.

6. The heat pump system as claimed in claim **5**, wherein said brine inlet means is located above said first and second heat exchangers.

7. The heat pump system as claimed in claim **2**, wherein said first heat exchanger is an air/brine heat exchanger.

8. The heat pump system as claimed in claim **1**, further comprising a third heat exchanger affixed on brine circulating pipes, interconnecting said reservoirs.

9. The heat pump system as claimed in claim **8**, wherein at least said unit and said second and third heat exchangers are made of materials non-corrosive to brine.

10. The heat pump system as claimed in claim **1**, further comprising a throttle valve affixed on a refrigerant carrying pipe interconnecting said second heat exchangers.

11. The heat pump system as claimed in claim **1**, wherein at least one of said reservoirs is further provided with water inlet means for adding water to the brine.

12. A heat pump system, comprising:

two substantially similar or identical units in fluid communication with each other, each unit including

a housing, an air/brine heat exchanger, a brine refrigerant heat exchanger, brine inlet means for applying brine into at least one of said heat exchangers, a brine reservoir and means for circulating said brine from the reservoir to said inlet means,

said brine/refrigerant heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction, and for reversing the sense of circulation of the refrigerant inside said close loop, and

ambient air heating means for heating the ambient air prior to the introduction thereof into said housing.

13. The heat pump system as claimed in claim 12, wherein said heating means is a water/air heat exchanger.

14. A heat pump system, comprising:

two substantially similar or identical units in fluid communication with each other, each unit including

a housing, an air/brine heat exchanger, a brine refrigerant heat exchanger, brine inlet means for applying brine into at least one of said heat exchangers, a brine reservoir and means for circulating said brine from the reservoir to said inlet means,

said brine/refrigerant heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction, and for reversing the sense of circulation of the refrigerant inside said closed loop, and

an external humidity source for adding humidity to ambient air introducible into said housing.

15. The heat pump system as claimed in claim 14, wherein said humidity source is a plant.

16. A method for air conditioning, comprising:

providing a heat pump system as claimed in claim 1, wherein the refrigerant's evaporator and the refrigerant's condenser exchange heat with brine solution, whereby the temperature of condensation of said refrigerant is reduced while the temperature of said evaporator is raised, thereby increasing the efficiency of the system.

17. The method as claimed in claim 16, wherein said first heat exchanger is thermally associated with said refrigerant's evaporator.

18. The method as claimed in claim 16, wherein said first heat exchanger is thermally associated with said refrigerant's condenser.

19. A method for air conditioning, comprising:

providing a heat pump system having two substantially similar or identical units in fluid communication with each other, each unit including

a housing, an air/brine heat exchanger, a brine refrigerant heat exchanger, brine inlet means for applying brine into at least one of said heat exchangers, a brine reservoir and means for circulating said brine from the reservoir to said inlet means,

said brine/refrigerant heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction, and for reversing the sense of circulation of the refrigerant inside said closed loop,

wherein the refrigerant's evaporator and the refrigerant's condenser exchange heat with brine solution, whereby the temperature of condensation of said refrigerant is reduced while the temperature of said evaporator is raised, thereby increasing the efficiency of the system, and

wherein said means for circulating the brine is adapted to circulate brine at a higher rate than the rate of circulation of the brine between said two reservoirs.

20. The heat pump as claimed in claim 1, further comprising means for circulating brine between said reservoirs.

21. A heat pump, comprising:

two substantially similar or identical units in fluid communication with each other, each unit including

a housing, an air/brine heat exchanger, a brine refrigerant heat exchanger, brine inlet means for applying brine into at least one of said heat exchangers, a brine reservoir and means for circulating said brine from the reservoir to said inlet means;

said brine/refrigerant heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction and for reversing the sense of circulation of the refrigerant inside said closed loop; and

means for circulating brine between said reservoirs adapted to circulate brine at a lower rate than the rate of circulation of brine between the reservoirs and said inlet means.

22. The heat pump as claimed in claim 20, wherein said means for circulating brine between said reservoirs are adapted to circulate brine at a lower rate than the rate of circulation of brine between the reservoirs and the second heat exchanger of each unit.

23. A heat pump system, comprising:

two substantially similar units in fluid communication with each other, each unit including

a housing, brine inlet means at the top portion thereof, a first heat exchanger located adjacent said brine inlet means, a brine reservoir at the lower part of said housing and means for introducing air into brine-dripping space delimited between said first heat exchanger and said reservoir, and

a second heat exchanger in liquid communication with said brine inlet means and said reservoir;

the reservoirs of said units being in liquid communication with each other;

said second heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction and for reversing the sense of circulation of the refrigerant inside said closed loop;

means for circulating brine between said reservoir and said second heat exchanger of each unit, and

ambient air heating means for heating the ambient air prior to the introduction thereof into said housing.

24. The heat pump system as claimed in claim 23, wherein said heating means is a water/air heat exchanger.

25. A heat pump system, comprising:

two substantially similar units in fluid communication with each other, each unit including

a housing, brine inlet means at the top portion thereof, a first heat exchanger located adjacent said brine inlet means, a brine reservoir at the lower part of said housing and means for introducing air into brine-

dripping space delimited between said first heat exchanger and said reservoir, and

a second heat exchanger in liquid communication with said brine inlet means and said reservoir;

the reservoirs of said units being in liquid communication with each other;

said second heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction and for reversing the sense of circulation of the refrigerant inside said closed loop;

means for circulating brine between said reservoir and said second heat exchanger of each unit, and

an external humidity source for adding humidity to ambient air introducible into said housing.

26. The heat pump system as claimed in claim **25**, wherein said humidity source is a plant.

27. A method for air conditioning, comprising:

providing a heat pump system having two substantially similar units in fluid communication with each other, each unit including

a housing, brine inlet means at the top portion thereof, a first heat exchanger located adjacent said brine inlet means, a brine reservoir at the lower part of said housing and means for introducing air into brine-dripping space delimited between said first heat exchanger and said reservoir, and

a second heat exchanger in liquid communication with said brine inlet means and said reservoir;

the reservoirs of said units being in liquid communication with each other;

said second heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction and for reversing the sense of circulation of the refrigerant inside said closed loop;

means for circulating brine between said reservoir and said second heat exchanger of each unit;

wherein the refrigerant's evaporator and the refrigerant's condenser exchange heat with brine solution, whereby the temperature of condensation of said refrigerant is reduced while the temperature of said evaporator is raised, thereby increasing the efficiency of the system, and

wherein said means for circulating the brine is adapted to circulate brine at a higher rate than the rate of circulation of the brine between said two reservoirs.

28. A heat pump system, comprising:

two substantially similar units in fluid communication with each other, each unit including

a housing, brine inlet means at the top portion thereof, a first heat exchanger located adjacent said brine inlet means, a brine reservoir at the lower part of said housing and means for introducing air into brine-dripping space delimited between said first heat exchanger and said reservoir, and

a second heat exchanger in liquid communication with said brine inlet means and said reservoir;

the reservoirs of said units being in liquid communication with each other;

said second heat exchangers being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in a selected direction and for reversing the sense of circulation of the refrigerant inside said closed loop, and

means for circulating brine between said reservoir and said second heat exchanger of each unit,

wherein said means for circulating brine are adapted to circulate brine at a lower rate than the rate of circulation of brine between the reservoirs and the second heat exchanger of each unit.

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